DOCUMENT RESUME

ED 348 963 IR 015 636

AUTHOR Kluever, Raymond C.; And Others
TITLE The Computer Attitude Scale: Assessing Teachers' Attitudes toward Computers.
PUB DATE Apr 92
NOTE 10p.; Paper presented at the Annual Conference of the American Educational Research Association (San Francisco, CA, April 20-24, 1992).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Attitude Measures; Computer Literacy; Correlation; Elementary Secondary Education; Factor Analysis; Microcomputers; Postsecondary Education; Pretests Posttests; *Self Evaluation (Individuals); *Teacher Attitudes; *Test Reliability; *Test Validity
IDENTIFIERS *Computer Attitude Scale

ABSTRACT

This study investigates the Computer Attitude Scale (CAS) in terms of reliability, factorial validity, and fit to a unidimensional model. The sample for this study consisted of 265 teachers from 20 schools and school districts in one state who attended evening and weekend classes that emphasized teachers teaching teachers about classroom applications of computers and software. Participants were given a computer attitude scale as a pretest and as a posttest 9 months later; a workshop evaluation; and a self-evaluation of teaching skills including computer use. The results of this study suggest that: (1) the CAS is a reliable instrument for measuring teachers' attitudes toward and impressions of the educational applications of computers; (2) the CAS can be used as a total score or separated into four related subscales; (3) pretest and posttest differences can be used as one indication of the effect of training in use of computers in schools; and (4) a pretest can be used to identify potential training emphases regarding teachers' attitudes about computers. Two tables display the data on item characteristics for each factor and differences between item responses from pretest to posttest. (ALF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED348963

The Computer Attitude Scale: Assessing Teachers' Attitudes Toward Computers

Raymond C. Kluever, Ph.D.
University of Denver

Tony C.M. Lam, Ph.D.
University of New Mexico

Eleanor Hoffman, Ph.D.
University of Denver

Kathy E. Green, Ph.D.
University of Denver

Dorothy L. Swearingen, M.A.
University of Denver

Paper presented at the Annual Meeting of the
American Educational Research Association (AERA)
San Francisco
April 1992

IR015636

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Raymond C. Kluever

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

THE COMPUTER ATTITUDE SCALE: ASSESSING TEACHERS' ATTITUDES TOWARD COMPUTERS

Appraisal of teacher attitudes toward computers gained importance following the widespread availability of microcomputers in schools and continues to be important as a result of a lack of use of those computers. The goal of programs addressing this problem is to encourage teachers to integrate computers into their classrooms. Programs of this sort provide instruction to teachers in hardware, software, and use of computers in the classroom. Evaluation of program impact often involves pre and post testing of participants' knowledge and attitudes. The Computer Attitude Scale (CAS) was developed by Loyd and Loyd (1985) for use with teachers. It is a revision of a measure originated by Loyd and Gressard (1984). The present study investigated the reliability, factorial validity, and fit to a unidimensional model of the CAS.

Attitudes toward computers have been examined by several researchers (e.g., Kay, 1989; Meier, 1988; Richards, Johnson, & Johnson, 1986). Lambert (1991) cautioned that evaluative attitudes toward computers (i.e., value of computer use) seem to be relatively distinct from affective reactions to computers. He found affective reactions to be highly associated with computer aversion but to have low correlations with evaluative attitudes. The nature of the relationship between computer attitudes and experience with computers is unclear (Koohang, 1987; Lambert, 1991). The CAS assesses both affective and evaluative aspects of attitudes with previous use suggesting significant relationships to computer experience.

The CAS was selected for use in this study because of its previous use with a similar group. The reliability and validity of the CAS was previously investigated in relation to its use with high school students (Loyd & Gessard, 1984a, 1984b) but Loyd and Loyd (1985) reported an analysis of the use of a revised version with teachers. They found four highly correlated subscales (computer anxiety, confidence, liking, and usefulness) from a factor analysis with subscale reliabilities ranging from .82 to .90. The total score reliability was .95. They found the subscales to significantly differentiate among groups with different levels of computer experience. Bandalos and Benson (1990) used the earlier , shorter version of the scale with undergraduate and graduate students and found a largely invariant factor structure over these groups as well as for males and females.

Method

The sample consisted of 265 teachers who attended evening and weekend classes addressing classroom applications of computers and software. The program stressed teachers teaching teachers about computer applications. That is, concepts from these instructional sessions were disseminated to other teachers in the participant's

school district and building. A large selection of software was available for review.

The participants were from twenty schools and school districts throughout the state. Sometimes one teacher represented a school; sometimes there were several teachers from each building. As a part of the project evaluation, participants were given a computer attitude scale as a pretest. Posttesting with the same scale was done at the end of the project, nine months later. The CAS and other instruments were distributed to teachers via group "resource" teachers and were returned by the resource teacher.

Other instruments used in this study were workshop evaluations and a self-evaluation of teaching skills that included computer use. Evaluation and attitude instruments were completed prior to the beginning of instruction and after the last session of the year. Participants completed all measures in their cluster groups and returned them to the program evaluator.

RESULTS

Results of the study are reported as an analysis of the pretest results, the posttest results, and then the differences between results of these two analyses. The initial data analyses included factor analysis, item analysis, and analysis using a one-parameter item response model (CREDIT: Masters, Wright, & Ludlow, 1981).

Results of the factor analysis (Table 1) suggested that item correlations are explained by four interrelated factors. These factors were labeled computer anxiety, efficiency, liking, and usefulness in instruction and are quite similar to the factors identified by Loyd and Loyd. Eigenvalues ranged from 14.8 to 1.5 for these four factors for a total of 54% of the variance. A principal components analysis with varimax rotation was used; items were interpreted that had factor loadings of .4 or greater.

Internal consistency reliabilities of the four subscales formed from the factors ranged from .72 to .91, with a total score reliability of .95. Items 9 and 10 detracted slightly from scale reliability.

Analysis of the data using a rating scale program suggested that the scale has several items that do not fit a unidimensional model (items 9, 10, 14, 23, and 38). When the dimensionality of each separate subscale was examined, the same items seriously detracted from creation of a linear measure. This suggests that several items of this measure may be in need of revision. Analyses were rerun with misfitting items deleted and with items failing to load on factors 1 through 4 deleted. This resulted in fit values that were more acceptable, though some items were identified that overfit, or were more highly discriminating than the typical item (see Table 1). Fit values, being sample dependent, fluctuated substantially between pretest and posttest data.

An examination of the item logit values in Table 1 suggests that the items do not vary greatly in position. In fact, attitudes of people in this sample were not as well measured by these items as is desirable. The items were too easy for people to agree with and tended to cover too narrow a range. Addition of items that discriminate very positive attitudes would be useful.

The posttest analysis included a repetition of the original analyses cited above. In the factor analysis (Table 1), four interrelated factors served to explain the item correlations as found previously. These factors were anxiety, liking, efficiency, and instructional usefulness, the same ones that were initially identified. These four factors accounted for 49.5% of the variance with eigenvalues ranging from 13.3 to 1.9. Items with factor loadings of .4 or above were used to interpret the factors using a principal components analysis with varimax rotation.

The reliability of the scale was .94 at the time of posttesting. The internal consistencies for the 4 factors ranged from .90 on factor one to .70 on factor four. Person separability values are presented in Table 1 as well.

Significant differences in pretest-posttest responses were found for 23 of the 40 items and for the first two factors overall. Item differences were equally distributed among all four factors as well as on items that did not load on any factor. Table 2 is a list of items with these differences and the factors on which they loaded.

DISCUSSION

The results of this study of a computer attitude scale suggest that the CAS is a reliable instrument concerning the attitudes and impressions of teachers about the educational applications of computers. It can be used as a total score or separated into four related subscales. Pretest - posttest differences found can serve as one indication of the effect of training in use of computers in schools. The scale can also be used as a pretest to identify potential training emphases regarding teachers attitudes' about computers.

In this study, some items showed greater change from pretest to posttest than others. The changes occurred among all 4 factors and could be a reflection of program emphases and materials or variability among subjects in their motivation and/or interest.

The mean person score found for this group was substantially lower than the item mean. This indicates that for the group sampled it was quite easy to agree with these attitude items. Items of a more extreme nature would be useful in assessing attitudes for a group of teachers who volunteered for computer training. When pretest attitudes are so positive to start with, it may be difficult to identify changes due to the program.

Table 1

Item characteristics for each factor

	Pretest			Posttest		
	Factor Loading	Logit Value	Fit	Factor Loading	Logit Value	Fit
Factor 1						
Item 1	-.75	-.70	2.82	-.61	-.34	2.36
Item 5	.74	-.13	.79	-.58	-.09	.85
Item 13	.57	1.11	2.82	.69	.61	-1.40
Item 21	.81	-.29	-4.80	.69	-.07	-3.76
Item 25	-.59	.06	-.29	-.51	-.01	.43
Item 29	.80	.17	-4.28	.74	.20	-1.99
Item 33	-.73	.48	-5.80	-.48	.33	-1.49
Item 37	-.83	-.22	-2.43	.75	-.02	-4.40
Item 40	.69	-.48	3.82	.52	-.61	4.27
Person Separability		.90			.82	
Factor 2						
Item 8	.68	.23	.40	.67	.20	-.82
Item 16	.65	1.28	-1.99	.74	1.01	1.49
Item 20	-.46	-.69	.42	-.75	-.54	-1.17
Item 24	.61	.13	1.86	.41	.26	1.50
Item 28	-.64	-.64	-1.82	-.74	-.42	-1.15
Item 36	-.65	.13	-2.86	-.79	-.51	-1.50
Person Separability		.82			.77	
Factor 3						
Item 3	.66	.56	3.54	-.44	.45	2.96
Item 7	-.52	.29	3.91	.60	.26	3.40
Item 11	.81	.10	-3.53	-.38	.20	-1.70
Item 15	-.76	-.56	-.88	.62	-.53	-.24
Item 19	.63	.53	-1.54	-.54	.38	-3.13
Item 27	.75	-.32	.87	-.74	-.28	-1.69
Item 35	-.80	-.24	-4.89	.74	-.14	-4.47
Item 39	-.80	-.36	-1.80	.25	-.33	-.26
Person Separability		.86			.80	
Factor 4						
Item 18	.54	-.58	-.31	.70	-.41	-1.83
Item 22	.66	.21	-.45	.64	-.10	.30
Item 30	.62	-.20	.82	.61	-.13	.01
Item 34	.63	.57	-.46	.42	.64	-1.23
Person Separability		.58			.41	

Table 2

Differences between item responses from pretest to posttest on the CAS scale and factors on which they load

Item		N	Mean	s.d.	t	df	p	Factor
Item 1	pre	193	3.22	1.59	.28	192	.780	1
	post		3.08	7.12				
Item 2	pre	195	4.68	1.68	-1.17	194	.243	
	post		4.77	1.68				
Item 3	pre	195	2.93	1.77	3.52	194	.001	3
	post		2.56	1.72				
Item 4	pre	196	2.59	1.89	1.14	195	.254	
	post		2.47	1.85				
Item 5	pre	196	4.65	1.34	-1.56	195	.121	1
	post		5.42	6.85				
Item 6	pre	197	5.13	.99	.44	196	.660	
	post		5.08	1.31				
Item 7	pre	136	4.81	1.20	-3.51	135	.001	3
	post		5.20	1.02				
Item 8	pre	138	4.93	1.14	-2.14	137	.034	2
	post		5.09	1.11				
Item 9	pre	138	2.78	1.47	3.59	137	.000	
	post		2.28	1.33				
Item 10	pre	140	2.04	8.29	1.08	139	.280	
	post		1.28	.74				
Item 11	pre	135	2.99	8.39	1.48	134	.141	3
	post		1.93	1.01				
Item 12	pre	140	1.60	.66	.88	139	.382	
	post		1.54	.84				
Item 13	pre	140	5.33	.88	-3.13	139	.002	1
	post		5.52	.72				
Item 14	pre	140	5.06	1.15	-2.53	139	.012	
	post		5.33	1.05				
Item 15	pre	140	4.92	8.11	.51	139	.614	3
	post		4.56	1.36				

Table 1 (cont.)

Item 16	pre	141	4.28	1.42	-2.76	140	.007	2
	post		4.60	1.29				
Item 17	pre	141	1.86	.99	2.41	140	.017	
	post		1.66	.84				
Item 18	pre	140	2.14	.91	2.58	139	.011	4
	post		1.91	.91				
Item 19	pre	196	2.34	1.22	4.90	195	.000	3
	post		1.89	.99				
Item 20	pre	196	4.08	7.01	1.28	195	.203	2
	post		3.44	1.84				
Item 21	pre	196	3.84	1.74	-5.20	195	.000	1
	post		4.23	1.87				
Item 22	pre	198	1.76	.81	1.51	197	.133	4
	post		1.66	.91				
Item 23	pre	197	4.41	1.46	-2.00	196	.047	
	post		4.67	1.51				
Item 24	pre	196	4.92	1.20	-3.16	195	.002	2
	post		5.19	1.09				
Item 25	pre	195	2.91	1.59	3.56	194	.000	1
	post		2.61	1.77				
Item 26	pre	197	5.17	.89	-3.34	196	.001	
	post		5.37	.92				
Item 27	pre	191	4.61	13.91	2.28	190	.024	3
	post		2.32	1.31				
Item 28	pre	197	2.28	1.30	3.17	196	.002	2
	post		2.02	1.27				
Item 29	pre	196	4.15	1.66	-1.59	195	.113	1
	post		4.92	6.99				
Item 30	pre	196	1.89	.97	3.53	195	.001	4
	post		1.65	.85				
Item 31	pre	189	4.84	12.11	1.22	188	.225	
	post		3.59	7.22				
Item 32	pre	197	5.21	.91	-2.93	196	.004	
	post		5.52	.92				

Table 1 (cont.)

Item 33	pre	198	2.62	1.56	2.22	197	.027	1
	post		2.46	1.69				
Item 34	pre	198	1.79	.87	4.42	197	.000	4
	post		1.53	.79				
Item 35	pre	189	5.28	12.04	1.53	188	.127	3
	post		3.93	1.81				
Item 36	pre	197	2.32	1.08	1.17	196	.242	2
	post		2.23	1.16				
Item 37	pre	196	4.83	6.90	.64	195	.526	1
	post		4.51	1.58				
Item 38	pre	193	4.54	1.52	-5.49	192	.000	
	post		5.12	1.36				
Item 39	pre	191	4.09	7.17	- .22	190	.824	3
	post		4.25	7.14				
Item 40	pre	197	4.42	1.43	-2.59	196	.010	1
	post		4.71	1.45				

References

Bandalos D. & Benson, J. (1990). Testing the factor structure invariance of a computer attitude scale over two grouping conditions. Educational and Psychological Measurement. 50. 49-60.

Kay, R.H. (1989). A practical and theoretical approach to assessing computer attitudes: the computer attitude measure (CAM). Journal of Research on Computing in Education. 456-463.

Koohang, A.A. (1989). A study of attitudes toward computers: anxiety, confidence, liking, and perception of usefulness. Journal of Research on Computing in Education. 137-150.

Lambert, M.E. (April, 1991). Psychometric issues in computer anxiety and attitudes: Assessment of college students. Paper presented at the American Educational Research Association annual meeting, Chicago.

Loyd, B.H. & Gressard, C. (1984). Reliability and factorial validity of computer attitude scales. Educational and Psychological Measurement. 44. 501-505.

Loyd, B.H. & Loyd, D.E. (1985). The reliability and validity of an instrument for the assessment of computer attitudes. Educational and Psychological Measurement. 45. 903-908.

Masters, G., Loright, B.D., & Ludlow, L. (1981). CREDIT: A Rasch Program for ordered categories. Chicago: University of Chicago Press.

Meier, S.T. (1988). Predicting individual differenes in performance on computer-administered tests and tasks. Computers in Human Behavior, 4, 175-187.

Richards, P.S., Johnson, S.W., & Johnson, R.T. (1986). _A scale for assessing student attitudes toward computers: Preliminary findings. Computers in the Schools, 3, 31-39.
Richards Johnson & Johnson